information, and a reference spatial distribution are stored and used for alignment, comparison, and/or imaging in subsequent scans.

[0088] The system **30** includes an image processor **34**, a memory **36**, a display **40**, a transducer **32**, sensor **37**, and a user input **38**. Additional, different, or fewer components may be provided. For example, the system **30** includes a transmit beamformer, receive beamformer, B-mode detector, Doppler detector, harmonic response detector, contrast agent detector, scan converter, filter, combinations thereof, or other now known or later developed medical diagnostic ultrasound system components. As another example, the system **30** does not include the transducer **32**, such as where the system **30** is a CT or MR imaging system. In yet another example, the sensor **37** is not provided, such as where the surface is determined from scan data. As another example, a tracking system for determining pose of the transducer **32** is provided, such as for freehand-3D.

[0089] The transducer **32** is a piezoelectric or capacitive device operable to convert between acoustic and electrical energy. The transducer **32** is an array of elements, such as a one-dimensional, multi-dimensional, or two-dimensional array. The transducer **32** may include a position or pose sensor and is used for freehand 3D scanning. Alternatively, the transducer **32** is a wobbler for mechanical scanning in one dimension and electrical scanning in another dimension.

[0090] The system **30** uses the transducer **32** to scan a volume and/or a plane. Electrical and/or mechanical steering allows transmission and reception along different scan lines. Any scan pattern may be used. Ultrasound data representing a plane or a volume is provided in response to the scanning. The ultrasound data is beamformed by a beamformer, detected by a detector, and/or scan converted by a scan converter. The ultrasound data may be in any format, such as polar or Cartesian coordinates, Cartesian coordinate with polar coordinate spacing between planes, or another format. In other embodiments, the ultrasound data is acquired by transfer, such as from a removable media or over a network. Other types of medical data representing a volume may also be acquired.

[0091] The sensor **37** is a depth camera, depth sensor, projector and camera, or another sensor for generating a surface of the patient. The sensor **37** is positioned in a calibrated or fixed location relative to the imager system **30** or detector for medical imaging, so that the spatial relationship of the sensor **37** to the scan data is known. The sensor **37** is positioned to capture a surface of the patient as positioned to be or as being scanned by the imager **30**.

[0092] The memory **36** is a buffer, cache, RAM, removable media, hard drive, magnetic, optical, or other now known or later developed memory. The memory **36** may be a single device or group of two or more devices. The memory **36** is shown within the system **30** but may be outside or remote from other components of the system **30**.

[0093] The memory **36** stores the scan data, location of scan planes, locations of lesions, a generated surface or other spatial distribution of the patient, lesion measurements, images, and/or other information from one or more scans. For example, the memory **36** stores an outer surface from the sensor **37** and/or an inner organ surface from scan data with the locations of one or more lesions and/or scan planes for one or more lesions. Measurements of an organ and/or lesions may be stored. The information from an examination is stored for later use to align with a current examination for imaging.

[0094] For real-time imaging, the scan data bypasses the memory **36**, is temporarily stored in the memory **36**, or is loaded from the memory **36**. Real-time imaging may allow delay of a fraction of seconds, or even seconds, between acquisition of data and imaging. For example, real-time imaging is provided by generating the images substantially simultaneously with the acquisition of the data by scanning. While scanning to acquire a next or subsequent set of data, images are generated for a previous set of data. The imaging occurs during the same imaging session used to acquire the data. The amount of delay between acquisition and imaging for real-time operation may vary. In alternative embodiments, the ultrasound data is stored in the memory **36** from multiple previous imaging sessions and used for imaging without concurrent acquisition.

[0095] The memory **36** is additionally or alternatively a computer readable storage medium with processing instructions. The memory **36** stores data representing instructions executable by the programmed image processor **34** for measurement point determination. The instructions for implementing the processes, methods and/or techniques discussed herein are provided on computer-readable storage media or memories, such as a cache, buffer, RAM, removable media, hard drive or other computer readable storage media. Computer readable storage media include various types of volatile and nonvolatile storage media. The functions, acts or tasks illustrated in the figures or described herein are executed in response to one or more sets of instructions stored in or on computer readable storage media. The functions, acts or tasks are independent of the particular type of instructions set, storage media, processor or processing strategy and may be performed by software, hardware, integrated circuits, firmware, micro code and the like, operating alone or in combination. Likewise, processing strategies may include multiprocessing, multitasking, parallel processing and the like. In one embodiment, the instructions are stored on a removable media device for reading by local or remote systems. In other embodiments, the instructions are stored in a remote location for transfer through a computer network or over telephone lines. In yet other embodiments, the instructions are stored within a given computer, CPU, GPU, or system.

[0096] The user input device **38** is a button, slider, knob, keyboard, mouse, trackball, touch screen, touch pad, combinations thereof, or other now known or later developed user input devices. The user may operate the user input device **38** to position measurement calipers, segment, or otherwise interact with the medical imager **30**.

[0097] The image processor **34** is a general processor, digital signal processor, three-dimensional data processor, graphics processing unit, application specific integrated circuit, field programmable gate array, digital circuit, analog circuit, combinations thereof, or other now known or later developed device for processing medical image data. The image processor **34** is a single device, a plurality of devices, or a network. For more than one device, parallel or sequential division of processing may be used. Different devices making up the image processor **34** may perform different functions, such as a same or different processors for generating images, registering surfaces or sparse spatial distribution, volume rendering, and/or guiding scanning. In one